Intra-Seasonal Oscillations in the Argentine Basin Observed From TOPEX/POSEIDON Altimetry

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The high accuracy of the altimetric measurement of sea level made by the TOPEX/POSEIDON (T/P) satellite has led to an unprecedented opportunity for studying the large-scale sea level variability over a wide range of time scales. At the intraseasonal scales, from weeks to months, the T/P observation is particularly useful because it provides the first global view of these relatively rapid changes of the ocean with small signals. In-situ observations do not have an adequate coverage to reveal the spatial patterns of such variabilities. Hot spots of significant intraseasonal variability were primarily found in the high-latitude oceans, the Southern Ocean in particular.

The focus of the paper is the finding of large-scale oscillations in sea level at a period of 25 days in the Argentine Basin of the South Atlantic Ocean from the T/P data. These oscillations exhibit a pattern of counter-clockwise rotational propagation centered at 45 deg. S and 317 deg. E over the Zapiola Rise, with a half wavelength of about 1000 km. The peak to trough amplitude is about 10 cm. The amplitude of these waves has large seasonal-to-interannual variations.

These oscillations are shown be a free barotropic mode of the basin as a solution to a linearized barotropic vorticity equation. Closed f/H contours provide a mechanism for the confinement of the waves to the topographic feature of the Zapiola Rise. Results from a numerical model simulation reproduced the observed pattern of the waves. The barotropic nature of the variability yields an estimate of the amplitude of the mass transport variation to be about 50 million tons per second. Deep current meters in the Argentine Basin reveal signals that are consistent with the altimetry observations.